Examples of Logos

When designing similar logos or devices, make sure:

- Each has three **different** transformations along the way.
- That you describe the final symmetry once drawn.

Only your final logo or device needs to be drawn perfectly. For your instruction steps you can use slightly rougher sketches (grid paper is useful).

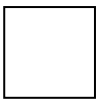
Leave any colouring, words or other complications added to your logo to **after** you have finished the Assessment requirements.

For Merit you need to be careful to specify all the features of each transformation

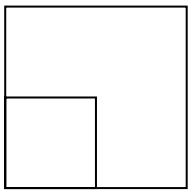
- any mirror line
- the centre of rotation, as well as the angle
- the centre of enlargement, as well as the scale factor
- the size and direction of any translation (vector notation is best)

You will notice that in the examples the shapes are often given letters in order to help describe the transformations more accurately. If you do this, be careful to define the shape fully in terms of those letters at the start.

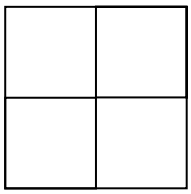
Start with a square of side length = x
(drawn with sides horizontal and vertical to the page)



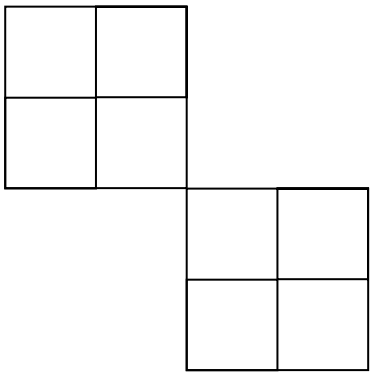
Enlarge it by scale factor 2, with the centre of enlargement being the bottom left hand corner.



Translate the **original** square by $\begin{pmatrix} x \\ x \end{pmatrix}$

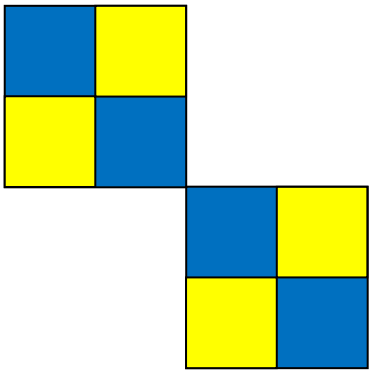


Rotate all four squares of this shape by 180°
about the bottom right hand corner of the large square.



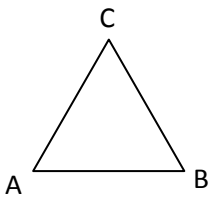
The resulting shape has mirror symmetry of 2
and rotational symmetry of 2.

It can be coloured to retain all the symmetry.



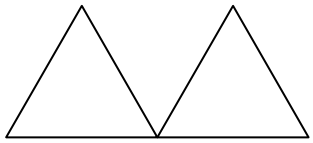
Draw an equilateral triangle, with each side = x cm

Call it ABC, where AB is a horizontal base, A on the left.

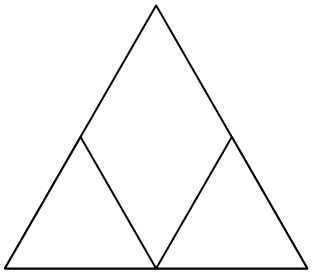


Translate that triangle the base length to the right = $\begin{pmatrix} x \\ 0 \end{pmatrix}$

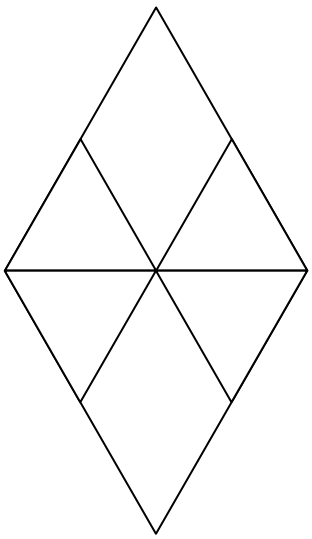
The new A' should now be the same as the old B



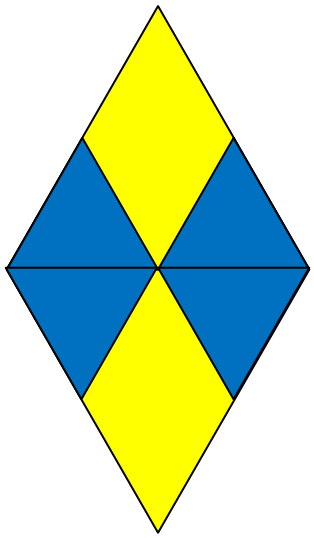
With the **original** triangle ABC, enlarge it
by scale factor = 2 with A as the centre of enlargement



Rotate the whole 180° object about point B



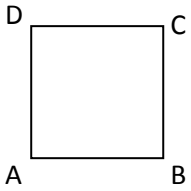
The logo has mirror symmetry of 2 and
rotational symmetry of 2.



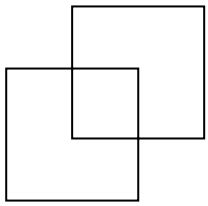
A coloured option that retains all the symmetry is shown.

Draw a square of side length x

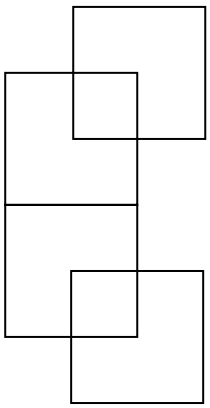
Call it ABCD, where A is the bottom left and B the bottom right. ½



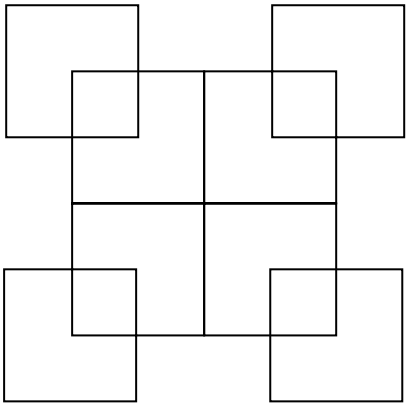
Translate the square by = $\begin{pmatrix} ½x \\ ½x \end{pmatrix}$



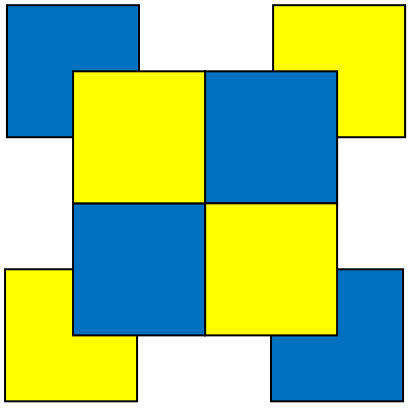
Reflect the two squares in a mirror line running along the line AB



Rotate the four squares 180° about A.



Uncoloured, the object has mirror symmetry four and rotational symmetry four.

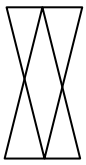


An option is to colour the inside squares alternating blue and yellow and the outside ones in the opposite colour, so that they look as if they are underneath. Note that it **loses** mirror symmetry if you do this, and reduces rotational symmetry to two.

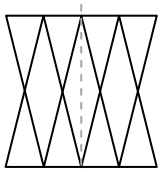
Draw an isosceles triangle twice as high as wide.
(Let width = w)

On the mirror line of the triangle, mark the point halfway up and call it X.

Rotate the triangle 180° about X.

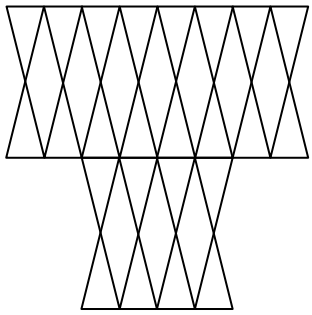


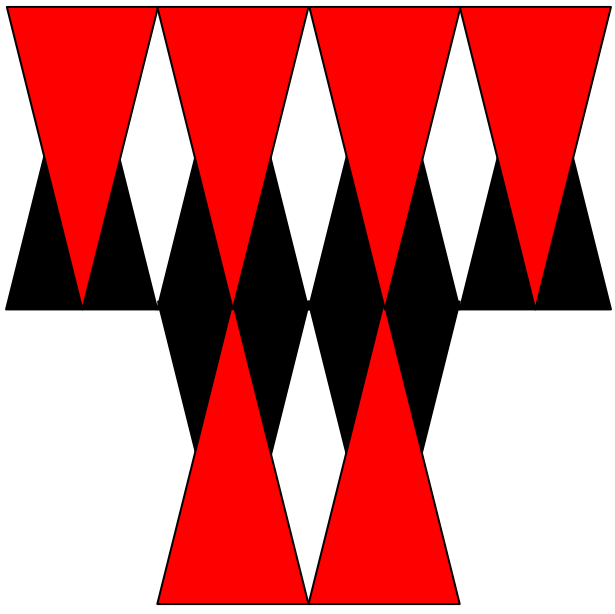
Reflect the shape in a line which runs down the two points on the extreme right of the shape.



Translate the whole shape one triangle width to the right and up one triangle height and one triangle
$= \begin{pmatrix} w \\ 2w \end{pmatrix}$

Do the same but now shift the original shape to the left one width and up one height $= \begin{pmatrix} -w \\ 2w \end{pmatrix}$

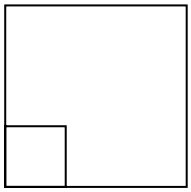




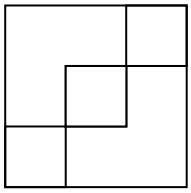
The resulting shape has one mirror line and no rotational symmetry.

Start with a square of side x drawn with horizontal and vertical sides

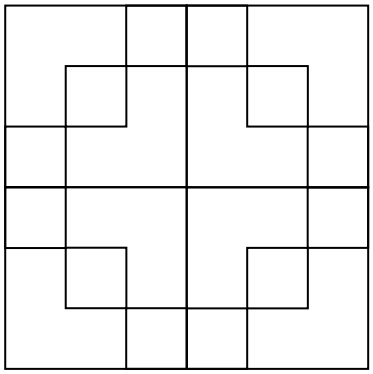
Enlarge it by scale factor 3, with the centre of enlargement being the bottom left hand corner.



Translate the **original** square by $\begin{pmatrix} x \\ x \end{pmatrix}$ and also by $\begin{pmatrix} 2x \\ 2x \end{pmatrix}$

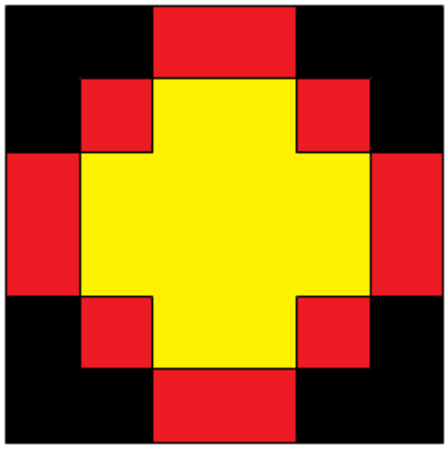


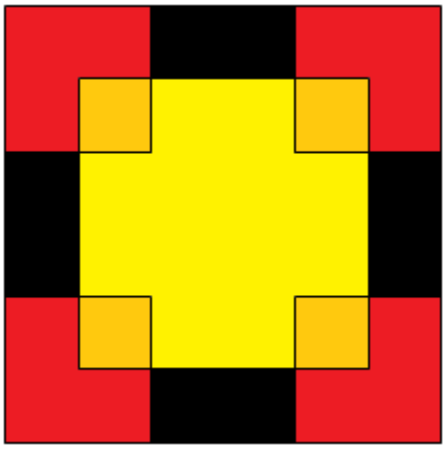
Rotate all four squares of this shape by 90°, 180° and 270° about the bottom right hand corner of the large square.



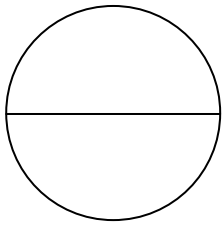
The resulting shape has mirror symmetry of 4 and rotational symmetry of 4.

It can be coloured in for interesting results.

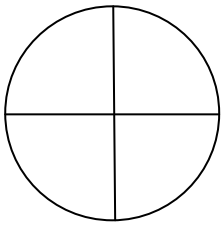




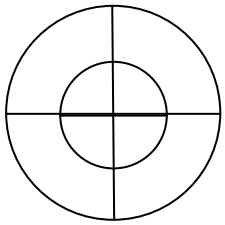
Take a circle of radius x, with a horizontal diameter on it.



Rotate the diameter 90° (either way) about its mid point.



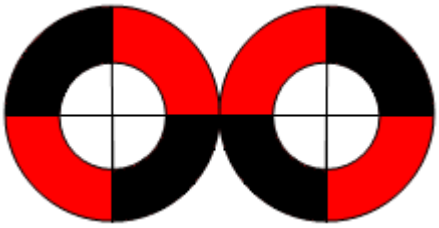
Enlarge the circle by scale factor = ½ about its centre



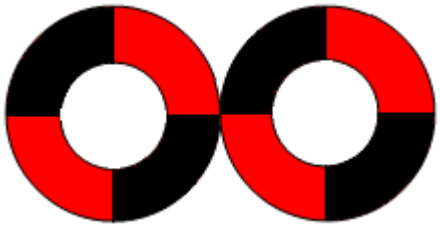
Shade in one of the outer quarters red and the next one along black then rotate them 180°about the centre of the circle.

Reflect this in a line running vertically just touching the right hand edge of the shape.

The shape has one mirror line
and no rotational symmetry.



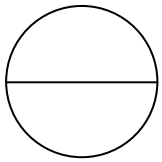
An alternative rather than reflect the first complete circle is to translate it by one diameter across = $\begin{pmatrix} x \\ 0 \end{pmatrix}$



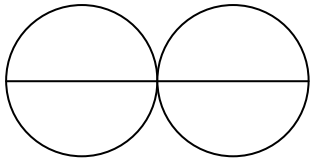
This gives a shape with no mirror, but 180° rotational symmetry.

(You can also remove the inner lines.)

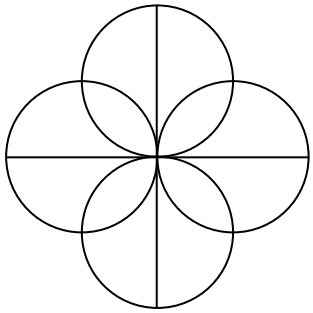
Take a circle of radius x, with a horizontal diameter on it.



Translate that to the right one diameter = $\begin{pmatrix} 2x \\ 0 \end{pmatrix}$



On top of this put a rotation of the entire shape by 90° anticlockwise (centre = where the two circles meet).



Enlarge the entire shape by scale factor = 2 about the point where the four circles meet.

The resulting shape has mirror and rotational symmetry of 4.